RESEARCH LABORATORY TECHNICAL REPORT

BARTLETT TREE EXPERTS
SCIENTIFIC TREE CARE SINCE 1907

Tree Planting Concepts

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Successful establishment of new plantings is dependent on correctly matching species to site, using proper planting techniques and creating a soil environment that will allow new transplants to rapidly regenerate a root system. During transplanting, more than 95% of a root system may be lost when the tree is dug by hand or with a tree spade. Soil surrounding the new plantings must have sufficient water, air space and nutrients to support rapid root regeneration to ensure plant survival. The following 10 steps will help ensure planting success.

1. Assess planting site characteristics prior to species selection

Soil analysis for pH, nutrient levels, organic matter content, texture and drainage is essential to match species with the site. Attempting to alter soil conditions to support a species cultural preferences can be expensive and is seldom successful. The presence of utility lines, buildings, streets and other structures must be considered when selecting species that are suited to the site.

2. Determine the available soil volume for the site

Soil volume, species selection and planting distances must all be considered to allow for tree maturity. Most premature decline of urban plantings is the result of water deficiency related to insufficient soil volume (root space). Research at Cornell University has provided methods to determine soil volumes to meet the water demands of mature urban trees. In general, at least two cubic feet of soil is required for each square foot of crown projection (crown projection is the soil area beneath the crown). Calculating available soil volumes and selecting species whose mature size is compatible with the site is an integral component of the planning stage.

3. Specify small caliper trees when possible

Small caliper nursery stock regenerates a root system to pre-transplant levels more quickly than larger transplants. This translates into higher survival rates and lower maintenance costs during the establishment period. Crown growth rates of small transplants are much faster than larger stock following transplanting. After a ten-year period, two-inch transplants will be a similar size to ten-inch stock. In general, 2 - 2 1/2" caliper or smaller stock is recommended. Larger sizes may be necessary in high use areas where vandalism is a factor.

4. Prepare a large planting area

The planting hole should be three-to-five times wider than the root ball, especially in heavy clay or compacted soils (Figure 1). This will allow rapid regeneration of the root system following planting. The depth of the planting hole must be no greater than the root ball to prevent settling and root mortality (see point 5 below). When preparing the planting site,amend the existing soil rather than use different backfill. In clay soils, using a well-drained loam backfill will result in water collecting in the planting hole following high rainfall, which can result in root mortality.

Amend the soil with fertilizer, organic matter, lime or sulfur per soil analysis results. After planting, backfill the root ball and add a layer of 2 - 3" of organic mulch, such as wood chips, to conserve soil moisture and moderate soil temperature. When planting in compacted or heavy clay soils, a wide planting hole should be dug or the soil outside the hole should be tilled. After planting, mulch the entire area.

Figure 1: The planting hole should be three-to-five times wider than the root ball

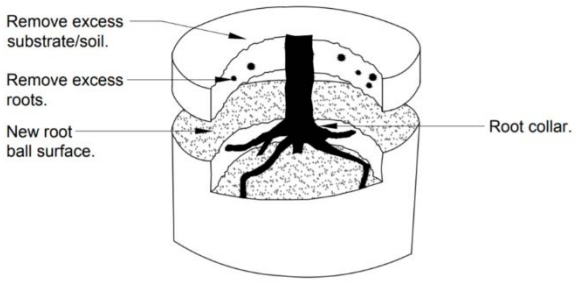
5. Ensure the root collar of the plant is flush with natural grade

Deep planting is a leading cause of death of new transplants. Specifications traditionally have required that the top of the root ball be flush with grade. Trees from some nurseries have soil on top of the root collar and against stem tissues. In these instances, the soil must be removed from the top of the ball until the root collar is exposed (Figure 2). Soil on top of the root collar may increase the incidence of stem disease and root disorders including root disease and girdling roots. When mulching after transplanting, make sure the mulch does not contact the trunk.

6. Remove deformed roots and foreign materials from root balls

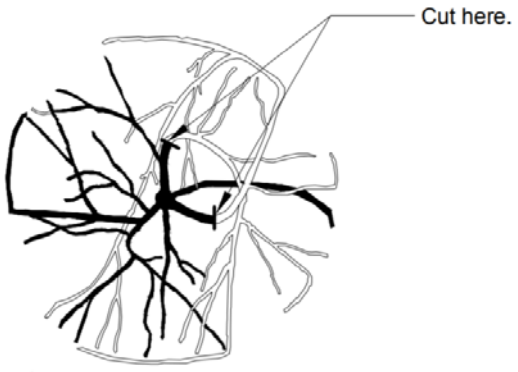
Roots redirected from containers or pruning practices can result in root systems that contain many types of

Figure 2: Soil must be removed from the top of the rootball until the root collar is exposed



root deformities. Circling roots are roots that encircle the root ball due to the redirection from plastic containers and can develop into girdling roots as time progresses. Girdling roots can severely limit water and nutrient transport to the tree canopy and cause decline. Similarly, roots might be directed lower or higher in the container and can lead to a reduction in stability of the planting. These defective roots must be removed prior to planting (Figure 3). This process involves dissecting the rootball to correct these roots, not only at the largest rootball size, but to also correct defects inside the rootball from smaller container sizes.

Figure 3: Defective roots must be removed prior to planting



This process can be completed manually with hand tools or with water or air excavation. The goal is to remove defective roots before planting because they will only worsen with time and become more difficult to correct.

Trees transplanted as balled and burlapped stock (field-grown) are not immune to these defects because many of these trees were previously grown in containers. In addition, wire baskets should be removed from the upper 6-8 inches of the ball to prevent girdling of major support roots. Synthetic burlap, nylon twine and straps must be removed entirely from the root ball. Natural burlap can become water repellant and must be removed from the upper part of the ball to facilitate water infiltration.

7. Do not wrap the trunk in most cases

Recent research reveals that tree wraps provide little benefit in terms of stem protection from temperature extremes. Wraps may actually increase the incidence of certain pest infestations. Leave lower limbs to shade the trunk rather than wrapping. With certain thin-barked species, on exposed sites, it may be prudent to temporarily wrap the bark when planting in the fall to reduce bark heating from sunlight. This should be removed in spring.

8. Stake or guy the plant only if necessary

Support systems should only be used to provide support or protect against strong winds and vandalism. Inspect guys periodically to ensure against girdling and bark injuries. Guys usually can be removed after one year.

9. Prune judiciously

Research has shown that pruning the crown to "compensate for root loss" actually impedes root regeneration and slows establishment.

Restrict pruning to removal of broken, dead and diseased limbs at planting. Heavy structural pruning should be delayed until the tree is established, but light pruning to address structural defects is reasonable (Figure 4).

10. Implement a plant health care program

Young transplants stressed by root loss are sensitive to environmental stress and pest infestations. Periodically monitoring the trees for soil moisture conditions, decline symptoms, pest infestations, nutrient deficiencies and other plant health related conditions will facilitate early detection and correction of problems before mortality occurs.

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Figure 4: Before planting (left) with three codominant stems and after (right) with reduction cuts made to aid proper structural development